HHS Public Access

Author manuscript

Health Educ Behav. Author manuscript; available in PMC 2022 October 25.

Published in final edited form as:

Health Educ Behav. 2021 October ; 48(5): 637–650. doi:10.1177/10901981211000312.

Trojan Horse: An Analysis of Targeted Advertising to Reduce Sexually Transmitted Diseases Among YMSM

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Abstract

Background.—Men who have sex with men (MSM) increasingly use internet-based websites and geospatial apps to seek sex. Though these platforms may be useful for public health intervention, evaluations of such interventions are rare. We sought to evaluate the online behavior of young MSM of color in Philadelphia and the effectiveness of using ads to link them to DoYouPhilly.org, where users can order free condoms, lubricant, and sexually transmitted infection test kits delivered via the U.S. postal service.

Method.—Data collection and analyses were conducted in two phases. First, we performed keyword research and analyzed web browser logs using a proprietary data set owned by Microsoft. Subsequently, we ran a Google Ads campaign using the keywords identified in the preliminary phase, and directed targeted users to the DoYouPhilly.org condom or test kit ordering pages. Results were analyzed using MATLAB 2018.

Results.—Test kit advertisements received 5,628 impressions, 157 clicks, and 18 unique conversions. The condom advertisements received 128,007 impressions, 2,583 clicks, and 303 unique conversions. Correlation between the click-through rate and the conversion rate per keyword was $\rho = -.35$ ($P = .0096$) and per advertisement was $\rho = .40$ ($P = .14$). Keywords that directly related to condoms were most effective for condom ordering (42% conversion rate vs. ≤2% for other classes), while keywords emphasizing the adverse effects of unprotected sex were most effective in test kit ordering (91% conversion rate vs. 13% and 12% for other classes).

Conclusions.—Online advertisements seemed to affect real-world sexual health behavior, as measured by orders of condoms and test kits, among a group of young MSM living in the same community.

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Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Keywords

big data; e-health; general terms; health behavior; internet; men who have sex with men; MSM; population groups; quantitative methods; sexual health; young adults

Men who have sex with men (MSM) are increasingly using internet-based websites and geospatial social networking applications to seek sexual and social encounters (Grov et al. 2014) and those who do are more likely to engage in unprotected sex (Liau et al., 2006). Among those who use these apps, MSM use them nearly 3 times as much as men who have sex with women (a mean of 22 times per week compared with 8 times per week, respectively; Woo, 2013). Consequently, it has been suggested that these platforms are an ideal place for public health messaging and disease intervention geared toward MSM (Wohlfeiler et al., 2013). However, few websites provide concrete public health interventions (e.g., free condoms), and even fewer studies evaluate their effectiveness.

Beyond the use of the internet to find partners, literature shows that MSM often search the internet for information on sexuality and sexual behaviors, sometimes exclusively so (Wilkerson et al., 2010). Several reasons have been cited for this behavior, including fear after contracting a sexually transmitted infection (Magee et al., 2012), stigma even compared with offline gay-specific venues (Bolding et al., 2007; Stahlman et al., 2015), or lack of comprehensive sex education at schools (Bolding et al., 2007; Currin et al., 2017).

A person's behavior online is reflective of their behavior in the physical world (Yom-Tov, 2016). For this reason, digital traces, including social media activity and search engine queries, have been used to learn about the health of populations (Giat & Yom-Tov, 2018; Lampos et al., 2015; Wagner et al., 2017). Online advertising has long been used to monitor population health (Eysenbach, 2006) and, more recently, to perform interventions leading to improved health (Yom-Tov, Brunstein-Klomek, et al., 2018; Yom-Tov, Shembekar, et al., 2018).

The Philadelphia Department of Public Health Sexually Transmitted Disease Control Program (PDPH-STD) has maintained a robust online health intervention presence for adolescents since 2011. To help address the epidemic of sexually transmitted infection and HIV among young MSM (YMSM) aged 13 to 24 years (Hoffman, 2017), in 2016, PDPH-STD launched DoYouPhilly.org (DYP), a campaign specifically geared to YMSM of color. DYP is unique in that its users can order free condoms and anal lubricant as well as genital, rectal, and pharyngeal chlamydia and gonorrhea testing kits delivered via U.S. postal service.

Though PDPH-STD has considered the DYP platform to be relatively successful based on the number of condoms ordered, we questioned whether we could better direct YMSM seeking partners online to a health behavior action. To this end, we constructed a quantitative study using digital traces to better understand online behavior of YMSM of color (YMSMC) in Philadelphia and to evaluate the effectiveness of linking these YMSMC online to real-world health interventions. Our analysis was designed to (a) identify websites frequented by YMSMC; (b) typify their online behavior comparing behaviors before and after online

events likely to precede sexual encounters; (c) understand the type of advertisements that result in both clicks to DYP and "conversions," that is, clicks followed by orders of condoms and/or test kits on the site; and (d) assess if the ordered condoms or kits are being used.

Method

Overview

Data collection and analyses were conducted in two phases: a preliminary phase and an advertising phase. In the preliminary phase, we hypothesized which search terms, or keywords, that YMSMC in Philadelphia might use before and after sexual encounters by analyzing an anonymized, proprietary national data set of web browser logs owned by Microsoft. In the advertising phase, we used the Google Ads system to run an advertising campaign that targeted persons using the keywords and phrases identified in the preliminary phase, and directed those users to the DYP website pages where they could order test kits or condoms. We made further iterations of the keyword and phrases list throughout this phase based on campaign results and Google AdWords recommendations. Final analysis was performed using MATLAB 2018. The institutional review board of the Philadelphia Department of Public Health approved this study.

Google Ads System

The Google Ads system works as follows: Ads are shown on a search engine results page when users perform a search. Advertisers financially bid for keywords relevant to their ads. Additionally, advertisers may indicate a preference for demographics (age, gender), location, and other parameters. Advertisers compete with other advertisers who chose the same keywords, by submitting bids. Then the advertising system chooses based on bid amount, which ads are to be displayed, and charges the bidder. This allows advertisers to increase their exposure by bidding higher. Each time the ads are shown on the Google Network, they are counted as impressions.

Phase 1: Preliminary Analysis

To determine what YMSMC search for on the internet, we compiled a list of preliminary keywords and terms most commonly used in profiles and ads soliciting sex on the Philadelphia regional sites for online dating and hookup sites/mobile apps, such as Craigslist, Jack'd, and Grindr (see Appendix D). Data were gathered from September 1, 2017, to December 31, 2017. These terms and phrases were then ranked by number of times they were used. Two of the authors determined whether these keywords and terms were appropriate to the local Philadelphia population in consultation with PDPH disease investigation staff. Next, we used a proprietary Microsoft data set of anonymized logs from consenting users from across the United States, composed of websites visited by users and any queries to search engines made by users, to find additional keywords. This data set is taken from an addon toolbar, which is publicly available and associated with the Microsoft Internet Explorer web browser. We extracted all queries (or "reference visits") to search engines (a) made up to 12 hours before and up to 72 hours after a visit to known YMSMC hookup and/or gay culture sites *or* (b) that used the preliminary keywords (mentioned above) in the search query. For example, if a user visited the hookup website www.adam4adam.com

(website visited) and/or searched their web browser using the keyword phrase “looking for top” (reference query), the other searches the user made before and after that initial website visit and/or search were extracted. Thus, our data contained the search query made by the user, the reference query or website visited, and whether the user’s search query was made before or after the reference query or website (keywords and websites are listed in Appendix A).

We hypothesized that we could construct a ratio that would reflect behavior that was influenced by what occurred before and during a reference visit. To do so, all queries made by at least 100 people within that 12- to 72-hour period were retained and ranked by the probability for them to appear after the reference visit, divided by the probability for them to appear before the reference visit. For example, if a query was made by 125 people before the visit to a hookup site, and then only made by 25 people after, a ratio of 5 was generated. The 100 highest ranked terms were used during the rest of the analysis.

Phase 2: Advertisement Campaign

We developed nine different ads promoting free mail order chlamydia/gonorrhea (CT/GC) test kits and nine ads for free mail order condoms. Two different types of advertisement text were created: those with “indirect” messaging and those with “direct” messaging. We defined indirect messaging as ads that contained language mimicking MSM sexual advertisements, such as “looking for bottom,” “twink,” or “seeking M4M.” We defined direct messaging as ads that promote the offer of an STD test kit or condoms in straightforward language; for example, “free condoms” or “free test kits” (Appendix B). Direct advertising has been traditionally used in public health campaigns, but previous work has shown that indirect ads (in nonhealth domains) have a positive effect on sales and evaluation of product attributes (Chaouachi & Rached, 2012).

We created two separate landing pages where test kits and condoms could be ordered. Unique HTML code was embedded in these pages so orders for either a condom or a test kit (called “conversions” by the ads system) could be accurately counted. The ads system was designed so that advertisements were initially shown with equal probability, but in subsequent runs were optimized to maximize conversions by showing the most successful advertisements, that is, those that led to more conversions in the previous rounds of advertising. For those who ordered test kits or condoms, we asked permission to send them a survey composed of questions about previous care, barriers to treatment, if they used any ordered condoms or test kits, and basic demographics.

Keywords

We tested keywords in three rounds (Appendix C). Keywords were modified based on their performance in previous rounds; keywords that produced conversions in the previous round were kept. For example, in the first round the keywords “sex,” “backpage,” and “seeking M4M” produced conversions, so they were kept in the next round. New keywords were also added to the second and third rounds. There were two methods for adding new keywords: (a) reviewing Google AdWords for suggestions of keywords to add and (b) identifying queries made within 30 minutes of another query that used a successful keyword (i.e.,

≥1 conversion). For example, for users who searched with the successful keyword phrase "free condoms," we then extracted other terms the users entered within 30 minutes of that search such as "best free gay date sites" or "boys only." The keywords were classified independently by two of the authors, into one of three classes (Table 1). If authors did not agree on keyword classification, a third author served as the tiebreaker; however, authors did not disagree. The three classes are as follows:

1. Direct Keywords: those directly related to condoms or to STD test kits
2. Adverse Keywords: related to adverse effects of unsafe sex
3. Cultural/Sexual Keywords: related to gay culture or to sexual encounters

Results

Campaign results in each of the three rounds are shown in Table 2. The first round of advertising (September 12, 2018, to October 3, 2018) yielded very few conversions; however, after successful keywords were retained and new keywords added to improve targeting, the number of conversions for condom orders increased greatly in the second round (October 9, 2018, to November 14, 2018; from 0.5/day to 4.2/day), as well as the third round (December 23, 2018, to January 15, 2019; 4.2/day to 5.0/day). This occurred despite the overall number of clicks decreasing with each successive round. For test kits, the number of conversions remained stable over the two rounds tested, despite the decreasing number of clicks.

Overall, the test kit advertisements received 5,628 impressions, 157 clicks, and 18 unique conversions (resulting in 20 orders in total). After duplicates and ineligible requests were removed from the total orders, 10 test kits were mailed (five test kits in Round 1, three in Round 2, and two in Round 3). Of the persons submitting orders, 19 provided consent to be emailed and 10 surveys were sent (accounting for duplicate and fake addresses).

The condom advertisements received 128,007 impressions, 2,583 clicks, and 303 unique conversions (resulting in 365 orders in total). After duplicates and ineligible requests were removed from the total orders, 281 condom packs were mailed (nine packs were mailed in Round 1, 131 were mailed in Round 2, and 141 were mailed in Round 3). Of the orders, 328 provided consent to be emailed and 246 surveys were sent (accounting for duplicate and fake addresses). None of the 246 surveys sent after either test kit or condom orders were completed.

Clicks Versus Conversions

The number of click-throughs and conversions peaked on different days of the week and declined during holidays. Most clicks happened from Tuesdays to Fridays, whereas the conversion rate was maximized on Saturdays and Tuesdays. Click-through and conversion rates were both lower (19% and 22%, respectively) during the end-of-year holiday season (December 25to January 1) when compared with the 8 days immediately following (January 2 to January 9). While click-through rates were comparable across devices, conversions were most likely from mobile devices (2.5 times greater than desktop). Correlation between

the click-through rate and the conversion rate per keyword was $\rho = -.35$ ($P = .0096$) and per advertisement was $\rho = .40$ ($P = .14$). Thus, keywords with higher click-through rates achieved a lower conversion rate, and the two were uncorrelated for advertisements (Table 1). We also note that the more expensive keywords did not necessarily result in more conversions.

Effective Keywords and Advertisements

Nine keywords and six specific advertisements resulted in more conversions than the others did. Very similar keywords and similar ads achieved very different conversion rates. For example, of those who used the keyword phrase “free condoms” and clicked on the advertisement, 50% resulted in orders from the website versus 8% when “Trojan condoms” was shown (Figure 1). Direct keywords, those that were directly related to condoms, were most effective for condom ordering (42% conversion rate vs. ≤2% for other classes), while keywords emphasizing the adverse effects of unprotected sexual encounters were most effective in causing people to order test kits (91% conversion rate vs. 13% and 12% for “direct” and “cultural” keywords, respectively). For example, the conversion rate was highest for the direct term “free condoms,” and second highest for the term “put condom.” The conversion rate for statistically significant terms and Spearman correlations between the day of the campaign and the number of impressions per day for each are shown in Figure 2.

Discussion

The recent growth of online social networking and hookup sites for YMSM has provided the opportunity for public health organizations to access “hard-to-reach” populations via online advertising campaigns. However, the effectiveness of these campaigns is difficult to evaluate, as user behavior beyond “clicks” can be difficult to determine. To our knowledge, this is the first study to investigate how search engine queries and keyword-targeted advertisements directly affect sexual health action in a cohort consisting primarily of YMSMC living in the community. The study resulted in several novel insights: More clicks do not equal more conversions, people online seem to be directly searching for what they want, and small changes in advertisement wording make a big difference.

Don’t Count on Clicks

Though number of condom and test kit orders was low, we found that provocative (indirect or cultural) ads elicited more clicks but did not result in more conversions. Rather, direct messaging, such as “Free Condoms and Lube” was most effective in generating conversions. We did note that conversions were most likely from mobile devices, similar to past research finding that sensitive topics were more likely to be accessed from mobile devices (Pelleg et al., 2013). Past research (Yom-Tov, Shembekar, et al., 2018), has also shown that there is little correlation between clicks and user actions and in fact can be inversely correlated (Yom-Tov, 2018). In our analysis, the number of clicks on any particular advertisement was an ineffective measure of public health success, if the goal is promoting healthy behavior. Studies of websites that are able to obtain higher numbers of conversions should be performed to confirm this association.

Searching for Hookups, Not for Safer Sex

Our findings show that advertisements for safer sex were not effective in generating conversions among those looking for sex or directly after a sexual encounter. Rather, advertising the adverse effects of STDs in ads for test kits and free condoms were more effective in producing orders of these products. Our data seem to show that generally, when people were looking for condoms, they were looking for condoms, and when people were looking for sexual encounters, they were looking for sexual encounters. PDPH-STD has run similar advertising campaigns targeting YMSM via hookup apps Grindr and Jack'd and on the social media sites such as Facebook, Instagram, and Snapchat. Results from these previous campaigns were similar to the current analysis: Advertisements for condoms and test kits on hookup apps resulted in significantly fewer health actions (condom and test orders) than did advertisements on the social media sites, where people were not directly looking for either a sexual encounter or for condoms or test kits (Hoffman, 2017). This may indicate that, in general, men looking online for sex are not interested in other actions at that time. A recent pilot study on the usability and acceptability of a mobile app designed for comprehensive HIV prevention in MSM demonstrated that, of those men who installed the app, 63.6% had ordered condoms at least once, and of those, 87.1% reported using them (Sullivan et al., 2017). However, this app was designed specifically for HIV prevention; thus, participation in the study demonstrated interest in HIV prevention, and clicks to the app reflect users' desire to engage in specifically health-related behavior. Conversely, another study on use of geospatial hookup apps for MSM showed that, on average, men had had condomless anal intercourse with more than half of the partners met through the app in the past 6 months, and that a propensity to seek out novel or risky sexual stimulation was correlated with higher number of partners met on the app with whom users engaged in condomless sex (Knox, et al., 2021). It is therefore conceivable that condom use may be considered undesirable for a substantial proportion of hookup app users and that condom ads may be less effective in this setting. More research on this topic is needed.

Wording Makes a Difference

There was a significant difference in performance of seemingly similar keywords (e.g., "Trojan condoms" vs. "free condoms"). Past work noted this differential response in a study that used internet advertising for cancer screening (Yom-Tov, 2018). For this reason, it is important to create a large, varied set of keywords and ads for campaigns, so that advertising systems can match them to a diverse population, reaching as many different behaviors and demographics as possible. Adding and removing words over time is easy to do and will not significantly increase the cost of the campaign.

Cost-Effectiveness

The average cost per conversion of our campaign was US$10.96. While this is not a negligible cost for reaching people, it is important to note that YMSMC are a potentially hidden population that is hard to reach in other ways. Though we do not have information on the cost of similar recruitment in the physical world, literature has found that online recruitment (especially for health research purposes) is highly cost-effective (Batterham, 2014; Christensen et al., 2017; Fenner et al., 2012).

Our findings also show that the more expensive keywords did not necessarily translate to more conversions. Therefore, we recommend that campaign managers track their campaign over time and remove such costly conversions (or cap the cost of conversions in the advertising system) so as to maximize the effectiveness of their budget.

Limitations

Our study has several limitations. We did not enable cookies on the landing page and, therefore, cannot prove that the conversion increase was due to new or repeat orders by users ordering with different addresses (duplicative orders were removed). While we were able to track keywords, advertisements, and orders of condoms or test kits, we are unable to determine if our advertising caused more people to actually use these products. Numbers of conversions were small and may not be fully powered to answer the study questions. Moreover, we did not explore the effect of any of the ads on future behavior: It is possible that these ads may make condom or test kit ordering more likely after the time period studied, even in men who did not order condoms or test kits at the time. Additionally, in the United States, Bing is a minority search engine, serving approximately 24% of the population. However, research has shown that the population that uses it is not significantly different when compared with those who use the majority search engine (Nitzburg et al., 2019), making it likely that this study can be generalized to a wider population.

Conclusions

Hookup websites and apps are often thought to be an opportune place to promote public health messaging (Chan et al., 2016). These kinds of public health campaigns are an effective way to reach stigmatized populations that are otherwise hard to reach (Bolding et al., 2007; Ko et al., 2012; Shrestha et al., 2020) in a way that is nonintrusive, private, and discreet. In this analysis, we demonstrate that online advertising is a viable way to reach the Philadelphia-area YMSM community. As we found in our campaign, clicks on an ad do not necessarily translate to condom or test kit orders. In this analysis, though numbers of orders were low, we found that certain online advertisements did work better and affect behavior more, as measured by orders of condoms and test kits among a group of YMSMC dwelling in the Philadelphia community. Effective advertisements required multiple iterations and the testing of various, similar keywords to optimize online health actions, as measured by conversions. Importantly, we also found that, at least in this analysis, the number of clicks on any given advertisement did not correlate with higher conversions. Calculating the number of clicks to indicate campaign success is not reliable, as the two may be unrelated. Rather, health practitioners and public health officials should pursue a more robust evaluation to understand the relationship between clicks and message success. Our findings clearly demonstrate the need to define campaign goals and how they can be measured. Specifically, health departments should distinguish between response to campaign messaging and campaign success. To perform effective evaluations of campaign messaging, we suggest implementing advertising systems that, by allocating more impressions to a successful term (one that results in conversions), can learn to identify the words, ads, and population demographics most likely to translate into positive health action.

Funding

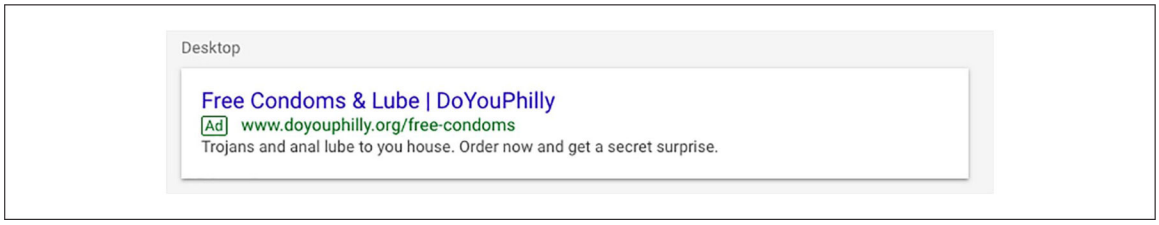
The author(s) received no financial support for the research, authorship, and/or publication of this article.

Appendix A: List of Keywords and Websites Used in Phase 1

Websites	Keywords
adam4adam.com	gay bar
atraf.com	gay dating
attitude.co.uk	gay hookup
axm-mag.com	blow n go
badi.jp	seeking cocks
bent.com	total top
bigmuscle.com	total bottom
blackinches.com	hosting for a bottom
blued.com	str8 but curious
boundandgagged.com	top looking
boyz.co.uk	bottom looking for top guy
buttmagazine.com	black bottom hosting
compatiblepartners.net	hung looking
destroyerjournal.com	hung seeking
dnamagazine.com.au	mutual oral
dudesnude.com	nsa bottom
elementmag.asia	nsa top
freshmen.com	nsa mutual fun
gabile.com	bear cock
gay.com	twink
gaydar.com	looking to suck dick
gays.com	dick my ass
gaytimes.co.uk	hung bull
grindr.com	hung bro
hardontv.com	mature bottom
instinctmagazine.com	mutual jo
jackd.mobi	looking for bbc
justusboys.com	boi pussy
maleflixxx.tv	m4m
mancrunch.com	icandy
manhunt.net	tavern on camac
manjam.com	stir lounge
outeverywhere.com	knock restaurant and bar
pinknews.co.uk	boxers phl
planetromeo.com	
qxmagazine.com	
rainbowchristians.com	

Websites	Keywords
scruff.com	
studiomagazines.com	
thebacklot.com	
xmo.nl	

Appendix B: Advertisements



Screenshots of How the Ads Appeared on Desktop and Mobile.

Advertisement Text.

Linked to condom order page	Linked to test kit order page
Free Mail Order Condoms | DoYouPhilly www.doyouphilly.org/free-condoms Free condoms to your house! Order now and get a secret surprise.	Free At-Home Test Kits | DoYouPhilly www.doyouphilly.org/testing He looked good last night but get checked for STDs. Request a free test kit now!
Free Condoms & Lube | DoYouPhilly www.doyouphilly.org/free-condoms Trojans and anal lube to your house. Order now and get a secret surprise.	Free At-Home Test Kits | DoYouPhilly www.doyouphilly.org/testing Test yourself for STDs in the comfort of your home. Request a free test kit now
Discrete Hosting | DoYouPhilly www.doyouphilly.org/free-condoms Don't forget the condoms and lube. Get your free mail order now.	Wild Night? | DoYouPhilly www.doyouphilly.org/testing Make sure you're STD free. Request a free at-home test kit now.
Discrete host. 0 feet away. | DoYouPhilly www.doyouphilly.org/free-condoms Make it hot. Trojans and anal lube to your house. Order now.	Discrete host. 0 feet away. | DoYouPhilly www.doyouphilly.org/testing He looked good last night but check if you're STD free. Get a free test kit now!
Bear, Twink, Discrete | DoYouPhilly www.doyouphilly.org/free-condoms No matter your tribe, protect yourself. Get free condoms and lube mailed to you.	Bear, Twink, Discrete | DoYouPhilly www.doyouphilly.org/testing No matter what tribe you belong to, get tested. Request a free test kit now!
Top? Bottom? Seeking m4m | DoYouPhilly www.doyouphilly.org/free-condoms Don't forget the condoms and lube. Get your free mail order now.	Top? Bottom? Seeking m4m | DoYouPhilly www.doyouphilly.org/testing Make sure you're STD free. Request a free at-home test kit now.
Living on the DL? | DoYouPhilly www.doyouphilly.org/free-condoms Play it safe. Get free condoms and lube mailed to you in a discrete package.	Living on the DL? | DoYouPhilly www.doyouphilly.org/testing Make sure you're STD free. Request a free test kit now!
On the DL | DoYouPhilly www.doyouphilly.org/free-condoms Play it safe. Get free condoms and lube mailed to you in a discrete package.	On the DL | DoYouPhilly www.doyouphilly.org/testing Test for STDs in the comfort of your own home. Order a free test kit now.
Seeking New Partner | DoYouPhilly www.doyouphilly.org/free-condoms	Seeking New Partner | DoYouPhilly www.doyouphilly.org/testing

Linked to condom order page	Linked to test kit order page
Play it safe. Get free condoms and lube mailed to you in a discrete package.	You should both get tested. Click here to request a free STD kit.

Note. STD = sexually transmitted disease.

Appendix C: Keywords by Round.

		Second round of keywords (+ previous round)			Third round of keywords (only kept previous round keywords that converted)		
First round of key words		**For condoms ad group**	**For test kits ad group**	**Removed**	**For condoms ad group**	**For test kits ad group**	**Kept keywords**
Shemale	Blow n go	Free condoms	Can chlamydia cure itself?	Porn	Best free gay date sites	Best antibiotic for gonorrhea	Free condoms
MILF	Seeking cocks	Trojan condoms	10 Panel STD test		Condoms being used	Chlamydia test	Sex
Naked men	Need a top	Bacterial infections	Anonymous STI testing		Black gay guy wants White guy	Common STD symptoms in men	Trojan condoms
Nudist	DL	Viral infection symptoms	Chlamydia cured		Boys only	Enter your symptoms	Gay
Porn	DL top	Put condom	Chlamydia gonorrhea symptoms		Dominic Pagnozzi	Free STD blood test near me	Backpage
Gay	DL bottom	Condom breaks	Chlamydia home kit		Ebsy Asianrx	Health questions symptoms	Put condom
Tube galore	DL bros	uBar	Chlamydia incubation period		Free gay pics	HIV cure	Sex M4M
Silverdaddies	Total top	Gayborhood	Chlamydia infertility		Free gay simulation games	HIV treatment cure	
Sex	Total bottom	iCandy	Chlamydia screening		Frontsis	Latest on HIV research	
Backpage	Hosting for a top	Gay men Philadelphia	Chlamydia test kit		Gay sites	List my symptoms find diagnosis	
Tubegalore	Hosting for a bottom	Stir Philadelphia	Chlamydia test kits				
Literotica	Seeking M4M	Stir lounge	Chlamydia testing kits				
XNXX	Oral for str8.bi	Gay dating	Chlamydia tests				
Pornhub	Str8 but curious	Skinny gay men	Chlamydia throat test				
Red RC	Top looking	Meet gay men	Free home test kits				

		Second round of keywords (+ previous round)			Third round of keywords (only kept previous round keywords that converted)		
First round of key words		**For condoms ad group**	**For test kits ad group**	**Removed**	**For condoms ad group**	**For test kits ad group**	**Kept keywords**
Seed bank reviews	Discreet	Meet Black gay men	Free STD				
fuq.com	Discrete	Gay colon cleansing	Free STD home test				
Queen of spades	FWB	Gay singles	Free STI testing around me				
Bliss	Bottom looking for top guy	Gay men forum	Gonorrhea chlamydia tests				
Spades	Black bottom hosting	Gay bear dating	Gonorrhea oral				
Heroin	Looking for a top	Gaymandating	Gonorrhea screening kit				
83net	Looking for bottom	Gay males	Gonorrhea symptoms				
Ripple	Looking for head	Homosexuality hooks	Gonorrhea test kit				
	Hung looking	Meet gay guys free	Home chlamydia testing				
	Hung seeking	Bisbee men bars	Home STD kits				
	Mutual oral	Local gay guys	Home STD screening				
	NSA bottom	Gay encounters	Home STD test kit				
	NSA top	Casual sex	Home STI tests				
	NSA mutual fun	Gay personals	Home test kits				
	Bear cock		Home testing kits				
	Twink slut		Incubation periods STDs				
	Twink		Mouth STD				
	Looking to suck dick		Oral chlamydia				
	Dick my ass		Penile swab test				
	Hung bull		Private STD Tests				
	Hung bro		Rapid test kits				
	Mature bottom		Rectal swab instructions gonorrhea				

First round of key words	Second round of keywords (+ previous round)			Third round of keywords (only kept previous round keywords that converted)		
	For condoms ad group	For test kits ad group	Removed	For condoms ad group	For test kits ad group	Kept keywords
Mutual JO		Rectal tests				
Looking for BBC		Self-diagnosis test				
Boi pussy		Self-diagnostic kits				
		Self-diagnostic STD test				
		STD				
		STD check kit				
		STD home kit				
		STD home kits				
		STD incubation				
		STD kits				
		STD mouth symptoms				
		STD panel				
		STD sore throat symptoms				
		STD sores				
		STD test cost				
		STD test kit				
		STD testing				
		STD urine testing kit				
		Urine testing kits				
		Will chlamydia go away				
		Throat chlamydia symptoms				

Note. STD = sexually transmitted disease; STI = sexually transmitted infection.

Appendix D: Glossary of Advertisement Terms

Advertisement Campaign

Running an advertising campaign requires creating short textual advertisements, choosing the website that people clicking on the ads will be referred to, and selecting the list of

keywords which, if used in a query to the search engine, will cause the advertisements to appear.

Keywords
Words or phrases describing your product or service that you choose to help determine when and where your ad can appear

Clicks
When someone clicks your ad, like on the blue headline of a text ad, Google Ads counts that as a click.

Impressions
How often your ad is shown. An impression is counted each time your ad is shown on a search result page or other sites on the Google Network.

Conversions
An action that is counted when someone interacts with your ad (in this project, placing a condom or test kit order).

Click-Through Rate
A ratio showing how often people who see your ad end up clicking it. Click-through rate can be used to gauge how well your keywords and ads are performing.

Cost per Conversion
Tells you how much, on average, each of your conversions costs. It is calculated by dividing your total cost by the number in your “Conversions” column. This calculation only applies to eligible interactions, so any clicks that cannot be tracked for conversions are removed from the calculation.

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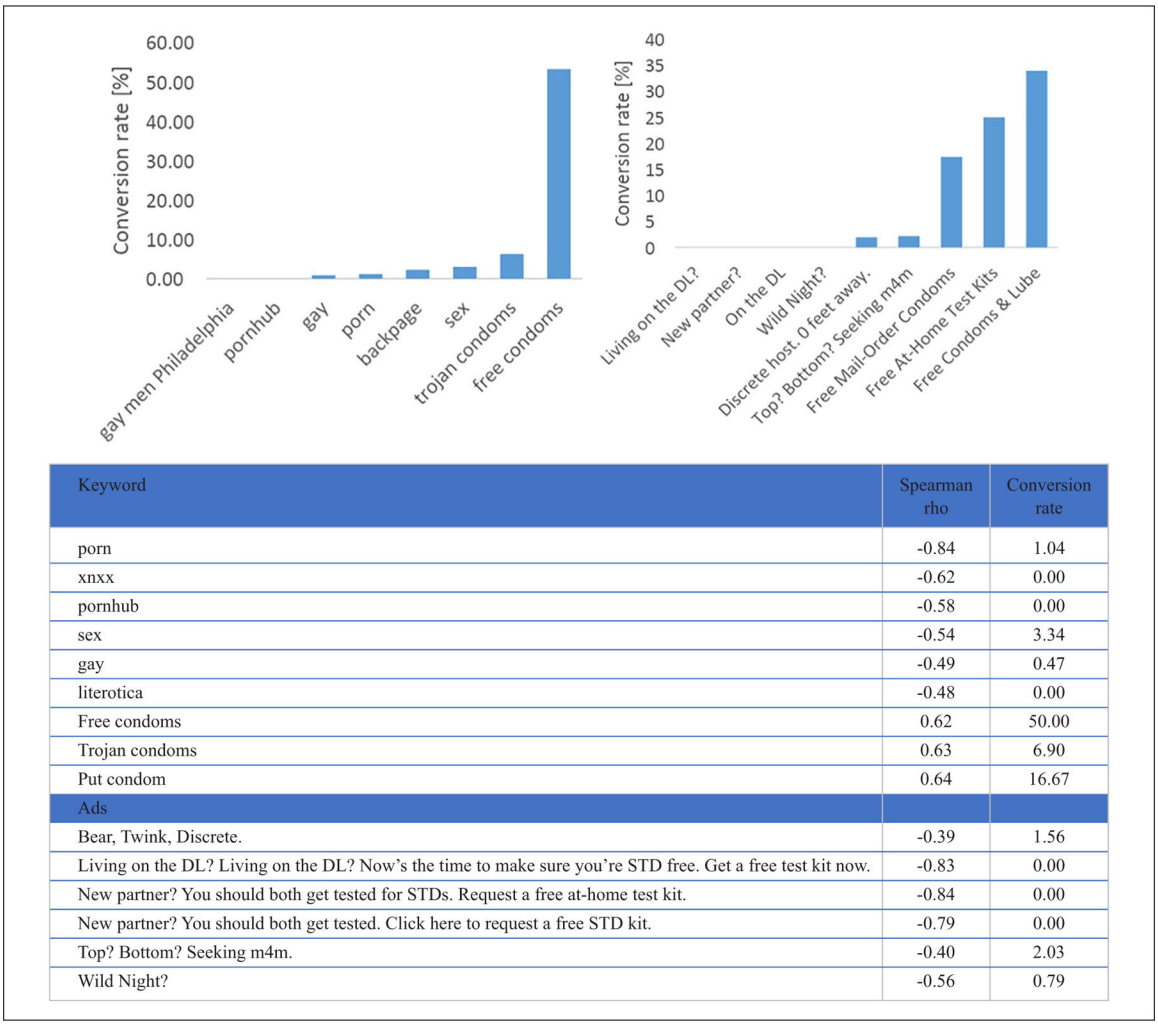

Keyword	Spearman rho	Conversion rate
porn	-0.84	1.04
xnxx	-0.62	0.00
pornhub	-0.58	0.00
sex	-0.54	3.34
gay	-0.49	0.47
literotica	-0.48	0.00
Free condoms	0.62	50.00
Trojan condoms	0.63	6.90
Put condom	0.64	16.67
Ads		
Bear, Twink, Discrete.	-0.39	1.56
Living on the DL? Living on the DL? Now's the time to make sure you're STD free. Get a free test kit now.	-0.83	0.00
New partner? You should both get tested for STDs. Request a free at-home test kit.	-0.84	0.00
New partner? You should both get tested. Click here to request a free STD kit.	-0.79	0.00
Top? Bottom? Seeking m4m.	-0.40	2.03
Wild Night?	-0.56	0.79

Figure 1.

Top graphs: Conversion rate for keywords (left) and advertisements (right) for items with ≥5 conversions. Items are listed in order of effectiveness. Above table: Keywords and ads that had statistically significant ($P < .05$, with Bonferroni correction) slopes of impressions per day.

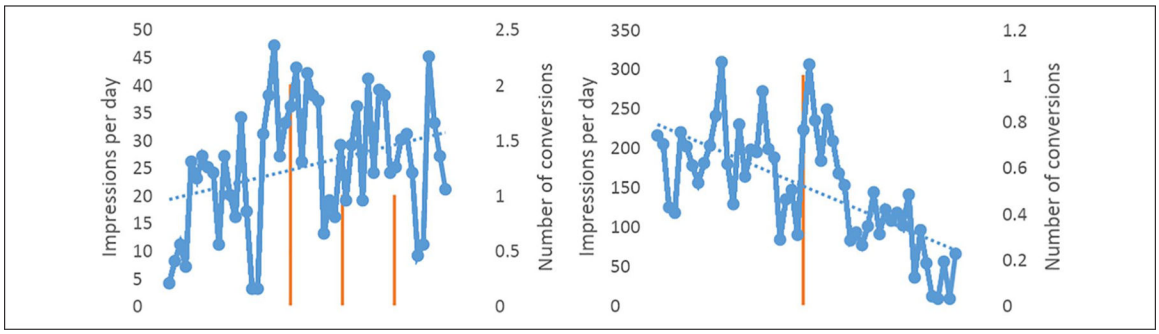

Figure 2.

Impressions over time for the keywords “put condom” (left) and “gay” (right). Orange lines denote when conversions were made. The dotted line is a linear regression fit to the number of impressions per day.

Table 1.

Keywords Classified by Message Type.

	Keyword	Landing page type	Conversions	Clicks	Click-through rate (%)	Cost/conversion
Messaging type	**Query words or phrases chosen to help determine when and where your ad can appear**	**Order from web page which the advertisement click led to**	**Those who clicked on ad and placed an order**	**Those who clicked on an ad**	**Ratio showing how often people who see your ad end up clicking it**	**How much, on average, each of your conversions cost (determined by Google AdWords)**
Direct (Condoms/STD testing)	Free condoms	Condoms	253	484	8.81	1.39
	Trojan condoms	Condoms	9	120	1.53	28.33
	Free STD home test	Test kits	4	22	5.20	10.91
	Put condom	Condoms	4	26	1.87	11.77
	STD testing	Test kits	3	25	3.19	16.41
	Gonorrhea test kit	Test kits	2	3	7.14	1
	Free STD	Test kits	2	22	2.74	21.84
	Chlamydia test kits	Test kits	0	2	20.00	n/a
	Chlamydia home kit	Test kits	0	1	20.00	n/a
	Self-diagnosis test	Test kits	0	1	7.14	n/a
	STD test kit	Test kits	0	3	5.56	n/a
	Chlamydia test	Test kits	0	2	3.51	n/a
	Home STD screening	Test kits	0	4	2.68	n/a
	Free home test kits	Test kits	0	2	1.77	n/a
Indirect (Sexually Explicit/MSM Culture)	Sex	Condoms	24	706	1.23	40.31
	Backpage	Condoms	7	310	5.48	69.48
	Sex	Test kits	6	41	4.72	8.45
	Porn	Condoms	2	193	2.37	112.5
	Gay	Condoms	2	237	2.35	116.1
	Seeking M4M	Condoms	1	81	10.80	74.13
	Gay dating	Condoms	1	17	9.66	20.92
	Seeking M4M	Test kits	0	1	33.33	n/a
	Mutual JO	Condoms	0	1	25.00	n/a
	Looking for bottom	Condoms	0	7	24.14	n/a

	Local gay guys	Condoms	0	3	20.00	n/a
	Meet gay men	Condoms	0	11	14.67	n/a
	Meet gay guys free	Condoms	0	3	13.64	n/a
	Gay singles	Condoms	0	8	10.67	n/a
	Free gay pics	Condoms	0	2	8.33	n/a
	Gay men Philadelphia	Condoms	0	35	7.26	n/a
	Gay sites	Condoms	0	3	5.66	n/a
	Tubegalore	Condoms	0	1	5.56	n/a
	NSA top	Condoms	0	1	5.00	n/a
	Twink	Condoms	0	10	4.57	n/a
	Gay	Test kits	0	7	4.43	n/a
	Looking for a top	Condoms	0	1	4.35	n/a
	Backpage	Test kits	0	3	4.35	n/a
	XNXX	Condoms	0	70	4.01	n/a
	Discreet	Condoms	0	23	3.98	n/a
	Gay personals	Condoms	0	3	3.70	n/a
	Gay males	Condoms	0	12	3.56	n/a
	MILF	Condoms	0	22	3.10	n/a
	Gayborhood	Condoms	0	15	2.98	n/a
	FWB	Condoms	0	3	2.68	n/a
	Discrete	Condoms	0	15	2.58	n/a
	Pornhub	Condoms	0	105	2.46	n/a
	fuq.com	Condoms	0	2	2.38	n/a
	DL	Condoms	0	17	1.47	n/a
Adverse effects of sexual encounters	Chlamydia cured	Test kits	1	1	2.94	1.2
	STD	Test kits	0	10	2.39	n/a
	Condom breaks	Condoms	0	1	1.18	n/a

	Ad text	Landing page type	Conversions	Clicks	Click-through rate (%)	Cost/conversion
Test kit keywords by ads	Free At-Home Test Kits: He looked good last night but get checked for STDs. Request a free test kit now!	Test kits	5	44	2.11	1.08

	Free Condoms & Lube: Trojans and anal lube to your house. Order now and get a secret surprise	Condoms	13	72	3.09	2.61
	Free Mail Order Condoms: Trojans and anal lube to your house. Order now and get a secret surprise	Condoms	0	2	2.41	n/a
	Living on the DL? Play it safe. Get free condoms and lube mailed to you in a discreet package	Condoms	0	1	4.17	n/a
	Seeking New Partner: Play it safe. Get free condoms and lube mailed to you in a discreet package	Condoms	0	1	3.13	n/a
	Top? Bottom? Seeking M4M: Make sure you're STD free. Request a free at-home test kit now	Test kits	0	13	3.18	n/a
	Wild Night? Make sure you're STD free. Request a free at-home test kit now	Test kits	0	1	4.55	n/a
Condom keywords by ads	Bear, Twink, Discreet: No matter your tribe, protect yourself. Get free condoms and lube mailed to you	Condoms	2	116	1.18	0.84
	Bear, Twink, Discreet: No matter your tribe, protect yourself. Request a free test kit now!	Test kits	0	19	1.10	n/a
	Discreet Host. 0 Feet Away: Make it hot. Trojans and anal lube to your house. Order now	Condoms	0	10	1.76	n/a
	Discreet Host. 0 Feet Away: He looked good last night but check if you're STD free. Get a free test kit now!	Test kits	0	54	0.69	n/a
	Discreet Hosting: Don't forget the condoms and lube. Get your free mail order now	Condoms	4	276	4.58	13.22
	Free At-Home Test Kits: Test yourself for STDs in the comfort of your home. Request a free test kit now	Test kits	0	27	0.61	n/a
	Free Condoms & Lube: Trojans and anal lube to your house. Order now and get a secret surprise	Condoms	235	728	2.16	0.88
	Free Condoms & Lube: Trojans and anal lube to your house. Order now and get a secret surprise	Condoms	24	106	1.70	0.59
	Living on the DL? Play it safe. Get free condoms and lube mailed to you in a discreet package	Condoms	2	97	2.22	1.94

Living on the DL? Make sure you're STD free. Request a free test kit now!	Test kits	0	10	3.13	n/a
On the DL: Play it safe. Get free condoms and lube mailed to you in a discreet package	Condoms	0	62	1.60	n/a
On the DL: Make sure you're STD free. Request a free test kit now!	Test kits	0	4	1.30	n/a
Seeking New Partner: Play it safe. Get free condoms and lube mailed to you in a discreet package	Condoms	0	10	3.82	n/a
Seeking New Partner: You should both get tested. Click here to request a free STD kit	Test kits	0	42	2.76	n/a
Top? Bottom? Seeking M4M: Don't forget the condoms and lube. Get your free mail order now	Condoms	10	460	2.44	11.03
Top? Bottom? Seeking M4M: Make sure you're STD free. Request a free at-home test kit now	Test kits	7	374	1.97	8.22
Wild Night? Make sure you're STD free. Request a free at-home test kit now	Test kits	1	128	1.83	14.15

Note. STD = sexually transmitted disease.

Table 2.

Advertising Campaign Statistics (per Day) for the Three Rounds of Keyword Use.

	Condoms			Test kits		
Round	Impression	Clicks	Conversions	Impression	Clicks	Conversions
1	2,332.4	35.4	0.5	—	—	—
2	989.5	29.7	4.2	361.2	8.6	0.1
3	777.3	18.3	5.0	7.5	0.8	0.1